

CPH NEW News and Views

A semi-monthly column on emerging topics related to healthy workplaces

Issue #55: Non-Pharmacologic Intervention to Improve Alertness and Vigilance in Older Shift Workers

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Night Work and the Older Worker

With the advent of a 24/7 society, the United States work force has seen an increase in individuals who work night, rotating, or alternating shifts. Along with this growing group of shift workers, the US population is rapidly aging, with an estimated 2 million adults aged 55 and over working such shifts. While night work itself causes problems with shortened and disrupted daytime sleep, these problems are exacerbated in older shift workers due to age-related changes in sleep regulation (Duffy, 2003). Over the short-term, insufficient and poor quality sleep can lead to inattention, an increase in work-related errors and injuries, and an increased risk of a motor vehicle accident while commuting (Barger et al., 2009). Over the longer term, it may also contribute to chronic health problems (Ramin et al., 2015). Treatments that can improve sleep quality and prolong sleep duration may help to reduce those health and safety risks.

Sleep-Wake Homeostasis and Circadian Rhythmicity Impair Alertness on Night Shifts

Night shifts are difficult for two reasons. First, humans are diurnal organisms and our circadian system promotes wakefulness during the day and sleep at night (Münch et al., 2007). We work against this aspect of our internal biology when we try to sleep during the day and remain awake at night. In addition, exposure to daylight on the morning commute home and on days off reinforces the day-time orientation of our internal biology, so that the circadian system of even permanent night workers fails to adapt to a night work schedule.

Second, night and day workers usually time their sleep very differently. Day workers typically awaken 1-3 hours before starting work and therefore arrive at work with very little "sleep pressure" (the amount of sleepiness that has built up since awakening). In contrast, night workers typically sleep after work and awaken 8 or more hours before their next night shift. This means that they start each night shift with a lot of sleep pressure, making it even more difficult to remain alert throughout the entire night shift.

Sleep Timing and Lighting Intervention Based on Sleep and Circadian Science

We have tested a treatment that was designed to improve night shift alertness and performance by reducing on-shift sleepiness, increasing alertness, and shifting circadian timing. The intervention consisted of two factors. First, on the night shift the participants moved their sleep to the afternoon so that they woke just an hour or two prior to their next night shift. Second, they received brighter lighting during the latter half of each night shift, both to increase their alertness and to shift the timing of their underlying circadian rhythms (Chinoy et al., 2016).

After four simulated day shifts, the participants were randomly assigned to two groups. The treatment group (n=9) had enhanced lighting (approximately 2,200 lux) from 03:00-07:00 during the next three night shifts. They were also instructed to go to bed between 1-2 pm and remain in bed, attempting to sleep, for a full 8 hours. The control group (n=9) were not given any instructions about when or how long to sleep and they worked night shifts in ordinary indoor light.

Study Findings

The treatment group followed the time-in-bed instructions, which allowed them to obtain similar amounts of sleep after the night shifts as they did on the day shifts (6-7 hours). The control group averaged only 3-5 hours of sleep after their night shifts. As expected, alertness and sustained attention were worse in both groups on the first night shift compared with day shifts, and continued to worsen on subsequent nights in the control group. However, the treatment group's sustained attention returned to day shift levels on night 2 and their subjective alertness returned to day shift levels by night 3. The treatment group also showed partial circadian rhythm adjustment after three nights (averaging nearly 3 hours), while there was no circadian adjustment in the control group. Overall, the treatment was effective in improving on-shift alertness and attention, increasing sleep duration, and shifting circadian timing to the night work and evening sleep schedule (Chinoy et al., 2016).

Future Research and Practice Implications

This study indicates that shift-work treatment strategies that incorporate sleep and circadian science can be effective in prolonging the sleep of older shift workers, reducing their on-shift sleepiness and inattention. This should also reduce the risk of work-related errors and accidents, a prediction that we now hope to test in field studies of shift workers. It is likely that each component of the treatment contributed to the overall results, and thus we plan to test them separately, because not all shift work situations or shift workers will be able to adopt both components. Given the adverse health and safety consequences of night work related to insufficient sleep and disrupted circadian rhythmicity, managers in 24-7 operations should incorporate sleep health and fatigue management strategies into their wellness programs.

Recommended journal articles:

1. Barger LK, Lockley SW, Rajaratnam SM, et al. Neurobehavioral, health, and safety consequences associated with shift work in safety-sensitive professions. Curr Neurol Neurosci Rep 2009; 9:155-64.
2. Chinoy E, Harris MP, Kim MJ, Wang W, Duffy JF. Scheduled evening sleep and enhanced lighting improve adaptation to night shift work in older adults. Occup Environ Med 2016;73:869-876.
3. Duffy JF. Shift work and aging: Roles of sleep and circadian rhythms. Clinics OEM 2003; 3:311-332.
4. Münch MY, Cain SW, Duffy JF. Biological Rhythms Workshop IC: Sleep and rhythms. Cold Spring Harb Symp Quant Biol 2007; 72:35-46.
5. Ramin C, Devore EE, Wang W, et al. Night shift work at specific age ranges and chronic disease risk factors. Occup Environ Med 2015;72:100-7.

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